Abstract

A platform for photoelectrophoretic transport and electronic hybridization of fluorescence labeled DNA oligonucleotides in a low conductivity electrolyte is described. A chemically stabilized semiconductor photodiode or photoconductor surface is coated with a streptavidin-agarose permeation layer. Micro-illumination of the surface generates photo-electrochemical currents that are used to electrophoretically transport and attach capture strands, preferably biotinylated DNA, to arbitrarily selected locations. The same process is then used to transport and electronically hybridize fluorescence labeled DNA target strands to the previously attached capture strands. Signal detection is accomplished either by a fluorescence scanner or a CCD camera. This represents a flexible electronic DNA assay platform that need not rely on pre-patterned microelectronic arrays.